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ABSTRACT

Details relating to the daily operation of the Computer Aids to Teaching project are provided, along with some feedback from readers of the previous issue of the newsletter. Following this are a brief article which discusses the possibility of making man-machine interactions more personal and a review of two seminars which dealt with the establishment of a National Science Network, a net of computers and computer users connected by high speed communications lines. A description of HYPERTEXT, a student-controlled instructional system consisting of pieces of discrete texts, is presented, followed by a look at the future possibilities of computer terminals in the home. Lastly, some instructions on how to operate a computer terminal are given. (LB)

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Computers And Teaching

An Interactive Newsletter

Northwestern University - Computer Aids to Teaching project

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"NEWS"

Winter Quarter begins January 4th, and with it the first full-scale operation of the *Computer Aids to Teaching* project. Equipment for use with our CDC 6400 has arrived and most of it works. The PLATO-IV terminal arrives this month. Several students have been making use of the Texas Instruments 725 and the three Hazeltine-2000s. All equipment is in the workroom,E1-316.

WORKROOM

The workroom will be kept open from about 10am to 6pm each day of the week except Saturday and Sunday. It may be closed from 12noon to 1pm when the computer isn't running, and on days when project personnel are all out of town. A bulletin board next to the door will show such days in advance. During workshops and demonstrations, the workroom will be "reserved" so that participants have first call on all equipment. Other people may then use the terminals only when they are not in use by participants.

WORKSHOP

The first workshop will be held January 8th and 9th, from 2pm to 5pm. An outline of topics appeared in newsletter 1. Anyone who would like to have lunch with us before the workshop (Monday or Tuesday) may bring his or her sandwiches to the workroom at 1pm.

EVENING HOURS

We will attempt to keep the workroom open in the evening, Monday thru Friday. It will require five volunteer faculty members or grad students, one for each night. They will each agree to take one night, and will supervise users of the workroom from 6pm to about 9pm. During that time they will help users "sign on" and will report equipment malfunctions. Each will have a key to the workroom for his own use during that quarter. If this doesn't provide anough access time, we'll be happy to consider alternatives -- the objectives are 1) to keep the equipment in working order, and 2) to provide someone who can "help" if there's trouble with any of the programs or equipment.

File cabinets in the center of the room are for people actively programming. Feel free to store listings, scratch paper, pencils, etc. in those drawers. Please put your name and phone number with your things, however, so we can reassign the storage space if it gets too crowded. No locks are provided, so don't leave anything of great importance in the cabinets.

PLATO-IV

The PLATO-IV "plasma display" terminal may arrive in late January. We will try to schedule "author" time for those who want to write lessons using this terminal, but there should be plenty of time for students to just drop in. The terminal we receive will have the plasma panel and slide projector -- the audio and touch-panel won't be arriving until later in the year. Stay tuned for details.

Jim Schuyler

Computers And Teaching
2003 Sheridan Road, Evanston, Il 60201

EM 011 667

INDEX TO C.A.I.

We just received the second edition of Helen Lekan's *Index to Computer Assisted Instruction* (C.A.I.). Though it is slightly out-of-date (1970), it lists a number of C.A.I. programs from other institutions which might be used here. Lessons are listed by subject matter (230 pages of listings) and are cross-referenced by language and other criteria. For each lesson listed, the following information is printed...

SOURCE, DESCRIPTION, PREREQUISITES, LEVEL OF INSTRUCTION, TYPE OF STUDENT, AVERAGE COMPLETION TIME, PROGRAM LOGIC, USE OF PROGRAM, SUPPLEMENTARY EQUIPMENT NEEDED, STATUS (completed or not), AVAILABILITY, FUNDING SOURCE, DESCRIPTIVE LITERATURE, LANGUAGE, CENTRAL PROCESSOR and TERMINAL DESCRIPTION.

The third edition of this useful book is now being printed and should be ready soon. Lessons written in TUTOR-III, TUTOR-IV, FORTRAN or BASIC can all be used here at Northwestern. If substantial interest (more than one person) is shown in COURSEWRITER (I.B.M.'s language for C.A.I.), we may be able to badger LINGO into accepting it too.

WORK IN PROGRESS NOW

An important conversion effort has begun this month with the support of the department of Pediatrics. Dr. Floy Helwig has obtained a Hazeltine display terminal and some programming money, and with our cooperation and direction will be translating the C.A.S.E. medical simulation into TUTOR-IV. CASE provides a medical student with a simulated diganostic session with a "patient". The student asks questions of the computerized patient and the computer responds to them. The object is to arrive at a correct diagnosis for the patient. Dr. Helwig's concern is that most medical students are exposed to pediatrics only a very short time, and do not get to see a representative sample of childhood diseases during that time. For instance, a student working during the summer might not see any common winter ailments. With the use of CASE, such students could receive a broader clinical experience than they could in the clinic alone. The general feeling is that it is better for the student to see a simulated case on the computer and perform the diagnosis than to never see that disease until he gets into actual practice.

The CAT project is involved in the conversion from COURSEWRITER-III, the version used at the University of Illinois Medical School (in Chicago), to the TUTOR-IV language, used at Urbana for PLATO-IV. There are differences between these languages at the most basic level -- response checking is entirely different. In COURSEWRITER-III, the computer looks thru the student's response for "key" words. It might, for example, look for the keyword "temperature". If the student asks "Is your temperature high?", the computer may reply "My temperature is normal." If the keyword isn't enough, the computer may search for further words within the request, to pinpoint what's being asked, then make the proper reply. In TUTOR-IV, the computer attempts to "understand" <u>all</u> of the words in the medical student's request. It doesn't scan for keywords at all! This means the CASE program must be entirely restructured to fit on PLATO. If you are considering transfering a C.A.I. lesson to our system, you should plan to consult us first about potential conversion problems ! That's what we're here for. In addition, we may be able to suggest some competent C.A.I. programmers to help you.

"FAST" COMPUTER LINES

At the time this page was being written, the 30 character-per-second phone lines were being installed on the CDC 6400. We expect them to be working this quarter. Their phone number is 492-7110. The old 10 character-per-second lines remain as 492-7081. Our terminals use both speeds.

FEEDBACK

I've been getting lots of feedback from issue number 1. Most of it is requests for reprints of papers and information. Some questions were asked and are reprinted below with answers...

Neat idea (the newsletter and CAT) especially if both positive and negative feedback is generated... This issue presented a clear idea as to "who", "what", "why". In fact, only the "how" was missing. How can instructors use CAI? For what is CAI suitable? For what is it not suitable?

Right on ! The "how" of CAI will fill the remainder of our newsletters. So far it has taken 14 years to get a real good hardware system goind - now we can really get to work on the educational problems.

What does A.R.P.A. stand for ?

Advanced Research Projects Agency.

One thought-provoking question asked me was essentially *"OK, so the computers are ready -- are the computer users ready or able to use them properly ?"* I don't have the answer to that one yet.

Another question I was asked frequently during the month was *"Why is the process of writing a CAI lesson so involved?"* My "gut" reaction to that question was to say "just think about how complicated it would be if you had to write lessons in a programming language, and didn't have the LINGO system". With truly admirable restraint I decided on the following explanation.

Writing a CAI lesson is complicated because you have to anticipate so many different student reactions to the material. In the classroom, you can field reactions one at a time, and you only have to deal with the actual reactions you get from a particular class of say 25 students. However, with CAI, you've got to plan once and for all for all sorts of potentials. I often liken the process of writing a CAI lesson to the writing of a detailed and flexible text book, with plenty of materials in it for both fast and slow students, and with an additional teacher's manual to go with it. And once the lesson has been written, it must be updated each term, to keep the examples current, and to respond to students' difficulties. This is why it takes so long to plan and execute a CAI lesson.

Actually, the process of writing the lesson on the computer is not as time-consuming or difficult as it could have been. The AUTHOR lesson is doing all of the work for you, calling the EDITOR, the compilers and preloaders, and making the final version of the lesson into a permanentfile. If you had to do all of this by yourself, you would need a ten week introductory course just to write a simple lesson.

One way to get materials on the computer quickly, and with maximum yield, is to write simulation programs. These programs are often easy to write, and once a format has been designed, you can often fit different sets of data into the same simulation model and allow students many hours of practice. An article by Lew Nathan follows, which explains some uses of games and simulations in our CAI system.

Readers are asked to try the online CAI system at their convenience. Drop in on use at room 1-316, or use your own terminal. Your comments on the articles in the CAT newsletter may also be entered via the ORACLE program, on-li e. See the TURNING IT ON article for instructions; once you've entered the CAI system, just ask for the lesson "ORACLE". The name of the ORACLE-group is COMPUTERS AND TEACHING. Comments entered via ORACLE are also printed here.

PERSONALITY

Inanimate objects are frequently given a feminine or masculine personality, as when a ship is called "she" or a robot "he". In a C.A.I. lesson, an inanimate object (the computer) communicates with the student. During this communication the computer is constantly reacting to the student's response to each lesson question. This reaction raises the question "Does a student using a C.A.I. lesson attribute a personality to the computer?".

A deeper understanding of personality in relation to the computer is needed to answer this question. Each C.A.I. lesson has qualities that characterize and distinguish it from other C.A.I. lessons, so the computer possesses a quasi-personality in each lesson.

By itself, the dull computer has none of the qualities of charm, enthusiasm, anger, etc. The lesson author, however, has the ability to vary his lessons' responses to the students. He could, for example, add "personality" to his lesson by sending comments to the student like "Glad to see you again, Joe.", or "I think you could do a little better if you read Chapter 7, Joe."

The addition of this kind of "personality" is easy, but not frequently done. The pertinent question, it seems, is "Does the student really react better if the computer says personable things?".

An available lesson, GAME THEORY, attempts to add "personality" to its lesson structure. Basically it teaches the student how to play a certain game and then plays that game against the student. Each of the eight games it can play has some personality added to it. How about trying it? It will joke with you, and even attempt to make "deals" at appropriate moments. Just wait till you see what it does when you cheat and break the deal!

Games

One of the forms of learning which takes place in C.A.I. systems is called "gaming". The student plays a game with (or against) the computer, learning from his mistakes and successes. The GAME THEORY lesson teaches the student how to calculate strategies for simple two-person games.

The PASSWORD game (like the T.V. game Password) teaches new words and stretches your vocabulary. It does this beneath the guise of a "fun" lesson. In PASSWORD, the computer chooses a short word and gives you synonyms for that word. You have to guess the word it is holding.

Can you imagine playing SCRABBLE against the computer?

Lew H. Nathan

Lew Nathan, the author of these articles, is a graduate student in Computer Science. He has written several "fun" lessons in the TUTOR language, which are available on the CDC 6400 here at N.U. and will be available on PLATO-IV. Lew loves to talk to non-computer people about the computer, and can often be trapped in our workroom if you are lucky.

NSN

The National Science Network would be a net of computers and computer-users connected by high-speed communications lines. The experience of the ARPANET shows that such a nationwide network can be built. If the NSN is constructed, it will face even larger problems because it will consist of both large and small, scientific computer users.

Professor Ben Mittman attended the second of a series of three seminars concerned with the NSN and Professor Duane Marble attended the first. A published book will result from these discussions, but to give you an idea what issues are being considered, brief summaries of the individual workshops are given here...

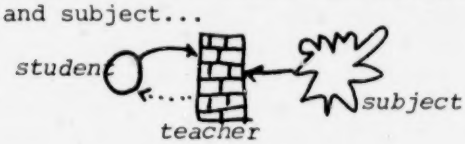
SEMINAR I: Four workshops -- 1) Computer Usage in Natural Science: The use of computers in arithmetic or symbol handling problems covers a broad spectrum of users from those who require large blocks of computer time or memory to those small users who in the aggregate also require extensive computer power. We feel that a properly developed network can accomodate both classes of users. 2) Databases, Statistical Analysis and Modeling: Although participants in this workshop had diverse interests, they had similar perspectives. 3) On-Line Responsive Systems: The spectrum of users went from writers through registrars, behavioral researchers, medical practitioners, designers and students. 4) Text Processing and Information Retrieval.

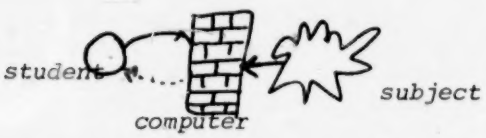
SEMINAR II: Four workshops -- 1) Network Management: Organizing and running a net involving different institutions and decentralized users, separate affiliations and dissimilar interests presents special management problems. Specifically to be discussed were a) the special problems of organizing a network, b) alternate approaches to managing the net, c) new organizational entities that might help, and d) how to get started building for the long term.
2) University Relations with Networks: An interuniversity net may offer a university member services and features that would be difficult for the university to provide for itself, but it also raises difficult questions of a political and organizational nature. The university computing center may have to redefine its role within the broadened context of a net, and the university administration may have to find new collaborative ways to relate to sister institutions. Most institutions participating in networks today aspire to be sellers of services while maintaining a high level of local general service. In viable networks, however, some institutions will have to be buyers and all will have to provide specialized services. 3) User Organizations: The most economic and appropriate way to locate, share and distribute resources in one field may or may not be the best way to do it in another. Users can organize themselves either by professional interests, mode of computer use, or supplier with whom they associate. Topics for discussion will be a) needs for sharing resources, b) current user organizations, their deficiencies and changes required for networking, c) new organizational forms and mechanisms that would be desirable, and d) steps to be taken.
4) Regional Networks: The many regional networks currently in operation force us to ask whether a national network could be formed by welding together a number of regional networks. The bridging of state and other jurisdictional boundaries is at issue, as is the degree to which the system runs the user or the user runs the system. Small institutions will not want to be swallowed up, and allocation mechanisms are needed to make sure that no users exert undue influence irrespective of the size of their institution. Topics to be included in discussion are: a) organizational entities, b) small user problems, c) resource allocation mechanisms, and d) interrelating regional networks to form a national net.

HYPERTEXT

Here's a beginning step toward HYPERTEXT. Invented by Theodor H. Nelson, it is a "mind expanding" way of looking at the computer in education.

A Hypertext exceeds the bounds of conventional C.A.I. -- conventional CAI puts the computer in the driver's seat. Nelson likens it to a brick wall between student and subject...

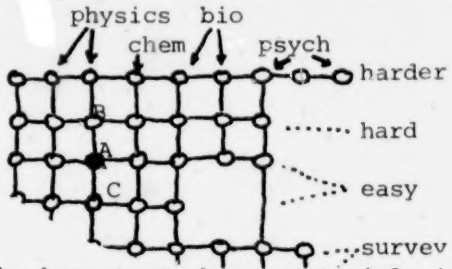




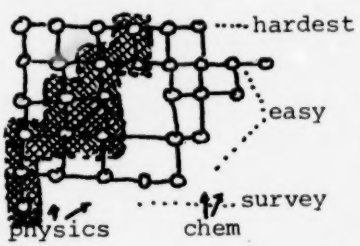
The trouble with CAI is it's too much like what we're trying to get away from -- it doesn't let the student freely explore the things which interest him. Instead, it still presents the "official" angle and its officially presented tie-ins. Both the regular classroom and CAI remove opportunities for initiative, they both bore the student, they give grades and narrow the curricula in order to produce "results".

In an ideal instructional system (a Hypermedium) "enthusiasm and involvement are what really count". The student is given an environment to explore, and is motivated only enough to get him started. Discrete, or chunk style, hypertexts consist of separate pieces of text connected by links. Ordinary prose may appear on the screen and be moved forward or backward by throttle. An asterisk may indicate a connection with some other point in the hypertext. A Hypergram is a performing picture. An angle might be drawn on the screen, and the student may turn it, with the computer varying the sine and cosine functions as it turns. A map might be projected, and the student may move it around, blow it up or make it smaller, at will. He might request additional overlays, such as population and climate. Or there may be queriable illustrations -- the student points at a part of the picture and gets an explanation of its function.

In HYPERTEXT, the student is in control. We could imagine a hypertext as a network of points with links between them.



In the hypertext above, materials in several subject areas have been integrated into the lattice. The student may "fly" above the lattice, looking at the descriptions the authors have entered for their nodes, or he may decide to "set down" and try a lesson, or look at a picture, or ask some questions. If the materials are too hard, he simply goes "down" in the net, if too easy, he flys "up". The student located at node A is receiving easy instruction in Physics. A single CAI lesson would normally span several nodes in the lattice. The lesson might change the student's position within the lattice, or he might decide to "fly" to another point within the lesson.



This is not the only way a HYPERTEXT can be used -- more information on Nelson and his idea will be forthcoming. The HYPERTEXT idea has already been implemented and is now being tested.
Next month: Further adventures in HYPERTEXT.

COTTAGE INDUSTRY

Some people think there will be a return to the home as the economic basis of our society by the end of this century.

As our economy moves more and more toward services and farther away from manufacturing, people find themselves doing tasks they could really be doing at home, if it were acceptable. Take programming a computer -- with time-sharing, the programmer could work from a back room, and could work any hour of the night or day. Or, if one felt the desire, it would be possible to set up neighborhood work-centers, where people gathered to do their work and drink coffee. Communication would be carried out on the telephone or picturephone. "Paper" based jobs would be carried out in conjunction with computer communication systems, in which the computer stored all information. Letters would be written by typing them into the computer -- then when the recipient signed-on, the letter would be printed on his terminal. A secretary could be located in Chicago for a boss in San Francisco; the secretary would handle communications and route letters via computer to the boss, who would dictate a reply. The reply would then be played back automatically when the secretary called the boss later in the day, typed into the computer and routed to the originator.

Is this a pipe dream? Perhaps not ! There are people in telephone companies today who look forward to the day when all calls will be included in the monthly charge. It would then be advantageous to work long-distance. The telephone network would hold your calls, record callers' numbers, route your calls to another number, or "camp" on a busy line. Once the computer has been connected to this network, just imagine the possibilities !

When PLATO-IV plasma-displays get down to $700 each (roughly the cost of a color TV console), people will begin to think of buying them for their families. Learning will take place in the evening, after school and during lunch breaks. The school may have to take on more socializing tasks -- teaching kids how to deal with each other and how to settle disputes. They may begin seriously trying to direct a student's inquiry, starting neighborhood study groups oriented toward solution of local problems. And the giant communication network may be used to form larger nationwide task-forces of people, communicating via the computer.

One of the first incursions into interactive computer controlled networks is the TICCIT (say "ticket") system, by MITRE Corporation. This is centered around a cable TV system in Reston, Virginia. The cable TV will be computer controlled, and will provide information and educational materials to citizens on their own television sets, as well as regular TV fare. Signals are sent to the individual TVs in the homes of children studying lessons, displaying information much like that PLATO-IV will display on its screens. The child presses a key on his telephone to respond. Eventually keyboards will be included. Shopping can be done the same way. Items are displayed on the screen, and buttons are pushed to order. Information of community interest can be displayed, and citizens can even vote on issues.

TICCIT is designed to be a local system, comprising a few hundred homes. Can you imagine what could be done on a truly large system such as PLATO-IV with thousands of homes ? It could change the structure of society.

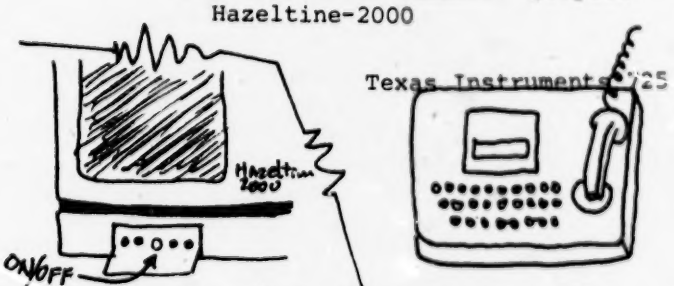
TURNING IT ON...

There are some simple things you have to do to turn a computer-terminal on...

1. Plug the terminal in and turn it on! The terminal may have both LINE and LOCAL positions -- use LINE. Some have an ON-LINE key you have to press. Be sure the acoustical coupler is also ON.

2. For 10 character per second operation, set the switch on the back of the Hazeltine-2000 (or on top of the TI 725) to 110 baud or 10 CPS. For 30 CPS operation, set to 330 baud or 30 CPS. Pick up the nearby phone and dial 7081 for 10CPS operation or 7110 for 30CPS operation. If the computer is busy, hang up and try again in a few minutes. If it doesn't answer, try again in five minutes. When the computer does answer, you will hear a high-pitched "scream" indicating that the computer is ready. Place the telephone handset in the cradle of the acoustical coupler as shown below...

Hazeltine-2000



It is important that the cord-end of the phone points the right direction. There is usually an indentation in the coupler showing the correct place for the cord-end. If the computer types TERMINAL IDLE, you're in business. If not, first check both terminal and coupler to be sure they're ON, then make sure you've set the proper speed for the phone number you called. If everything was ok but nothing happens, ask for help !

3. Now indicate your account number, name and class. Account is two letters, four numbers, a dash and four more numbers. Use first and last initials and class number (if any). If my charge number were XX0000-0000, I might type...

```
XX0000-0000,JS-C95
```

IMPORTANT: You must press CR or RETURN after every line you type. You may then begin typing only when the computer has printed another question mark.

Did you press CR after typing C95 above? You should have !

4. If you correctly entered your account number, the computer will print some short messages and say...

```
CONTROL CARDS:
?
```

You then type two lines...

```
CAI.
)E
```

Be sure to press CR or RETURN after each.

Those two lines tell the computer to enter the Computer-Assisted-Instruction subsystem. CAI will ask for an ID number (if you forgot, just type any number) your name (you may fake this) and the type of terminal you're using. Do not tell it where your terminal is -- tell it what your terminal is.

5. Finally, the computer asks you what lesson you want to run. Type its name or type LESSONS to get a current list of lesson names. Instructions on how to write your own lessons are in the LINGO manual, available from Vogelback Computing Center, Evanston campus.

There is a lesson called EDITOR for those who want to run BASIC or FORTRAN.

Lessons are available for saving and restoring files on magnetic tapes, to save expense and trouble.

More information may be obtained from

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FEEDBACK CARD:

Please indicate what you want clearly. Do you want to add someone's name to the list? Would you like to write a one or two-page "article" for us? Have you used CAI on the CDC 6400 -- how was it ? Fold over and drop this in campus mail.

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